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ABSTRACT

This paper describes the use of electronic journals (e-journals) and technology portfolios as an instructional strategy in preservice teacher education technology courses. Introduction to Media and Computers in Teaching is an introductory level, two-credit, preservice teacher education course offered at the University of Virginia. In this course, the instructors use e-journals as a way to examine the students' learning throughout the semester and to model a strategy they can later utilize in their own classrooms. After each class, students create an entry in their e-journals using a word processing program. Whereas e-journals demonstrate learning in its developmental phases, portfolios represent the culmination of a student's work over a period of time; in this course, students collect examples of their work over the course of the semester for inclusion in their technology portfolios. The use of technology portfolios and e-journals places an explicit focus on the relationship between technology applications and instructional methods. This reflexive approach to training encourages students to consider technology as both a user/learner and a user/teacher. (AEF)

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC).

Instructional Strategies for Integrating Technology: Electronic Journals and Technology Portfolios as Facilitators for Self-Efficacy and Reflection in Preservice Teachers

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For most undergraduate teacher education students, technology skills begin and end at the basic survival skills of paper writing using a word processor and, perhaps, sending e-mail. Frequently, these students approach a required technology course feeling some fear or anxiety related to the more sophisticated use of computers. They often perceive themselves as novice technology users, discounting their own level of experience with word processing software and e-mail as a useful foundation for further skill development. Factors contributing to this are the preservice teachers' insufficient experience with computers, their lack of understanding of how interactive technologies can easily be integrated into the curriculum, and little confidence in their abilities to acquire computer instruction (Hunt and Bohlin, 1991; Zelman, 1986). In addition, the enormous marketing hype that surrounds technology suggests that anyone less than a power-user is hopelessly unhip, a sensitive claim for most undergraduate students (Kovalchick, 1997).

When students have no training or experience and have no confidence, reluctance to use technology is rooted in computer anxiety or "computerphobia" (Kennewell, 1992). Many preservice teachers are not so much afraid of the machines themselves, as of their own ignorance and lack of understanding. Electronic journals (e-journals) offer students an outlet to share their fears, hopes, and expectations with the instructor about their learning experiences. They also allow the student to communicate with the instructor how they are understanding the content, sequence, and even presentation of the material. Technology portfolios provide students the opportunity to demonstrate their accomplishment and to reflect upon their learning over the course of a semester. This paper describes the use of e-journals and technology portfolios as an instructional strategy in preservice teacher education technology courses.

Description of the Course

Introduction to Media and Computers in Teaching, EDLF 345, is an introductory level, two credit, preservice teacher education course offered every fall at the Curry School of Education at the University of Virginia. The majority of the students are preservice teacher education students—in their third year of college—who are interested in teaching at the elementary, middle, or high school level. A minority are in the Masters of Teaching program; and a few are non-education students. All preservice teacher education students are required to take the course. Those more technologically advanced can substitute a three credit technology course also offered in the Curry School.

E-journals

Journals, widely used as an instructional strategy in the language arts and other subject areas at the K-12 level, are finding their way into teacher education as a way to facilitate the development of reflective thinking. A journal, or learning log, is a compilation of students' reflections, learning, and feelings about a certain subject or topic. They can be used in a number of ways: for example, teachers can ask students to write in an open-ended manner about the content they have learned, questions they still have, and how the content relates to their own experience. Or, teachers can provide students with prompts for them to write about in their journals.

Journals can provide teachers with a way to assess and monitor student development throughout the learning process, which is not possible through standardized tests or other one time measures. Because they require students to synthesize and reformulate what they have learned, journals and their word processor equivalents, e-journals, serve to

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foster students' higher order thinking. An e-journal is basically the same as a paper and pencil journal, but it is composed using a computer and software program.

Using E-journals with Preservice Teacher Education Students

In EDLF 345 the instructors have begun using e-journals as a way to examine the students' learning throughout the semester and to model a strategy they can later utilize in their own classrooms. After each class, students create an entry in their e-journals using a word processing program. They are encouraged to write about whatever they like related to the class. The following questions provide some guidance for those who do not know what to write about:

- What did you learn today?
- How do you feel about using technology?
- What was the most useful/meaningful thing you learned in today's class?
- How could you apply the content of today's class in your personal, academic, or future professional life?
- What did you contribute to today's class?
- What could the instructors do to improve today's lesson/the course?
- What are some of your questions or concerns regarding the class?

Each entry is dated and saved in the same file. They are sent to the instructors via e-mail as an attachment three times during the semester. The journals are intended to provide students a map of where they have been and underline the evolutionary process of their learning as it unfolds. They begin to see that learning is sometimes messy, frustrating, and often announces itself in short spectacular "ahas!."

E-journal Entries

Fall 1997 (E-journal entry)

I was a bit intimidated before making my newsletter and had no idea that I could do as much of it on my own as what I did. I have little experience with computers and the class lesson that day went a little fast for me, I wasn't quite able to keep up. Thanks for listening.

In many technology classes, students are reluctant to ask questions during class because they are embarrassed or feel that they are the only ones experiencing such problems. E-journals provide a safe way to ask questions, converse with, and offer suggestions to instructors about the class.

A preliminary analysis of student e-journals reveals a pattern in the types of responses included. Their responses generally fall into two categories, "making connections within the classroom" and "making connections outside the classroom." Below is a table outlining the types of entries in each of these categories.

The following e-journal entries illustrates the different categories described above:

Example 1

This seems to be an appropriate time in the semester to reflect and discuss how I feel about using technology. At the beginning of this course I was absolutely petrified of having to take a computer class. I feel comfortable with a word processor, and that is about the extent of my computer background. I was one of these people who think that I will be able to skim by without ever having to use a computer other than having to type a report. I am beginning to realize that this is highly unlikely, especially while hoping to enter the field of teaching. I now realize that I need to be up to date with the needs and concerns of students in a rapidly

Table 1.
E-journal response patterns.

Making Connections within the Classroom:	Making Connections outside the Classroom:
Reflective student: These entries are typically written in diary format, they recount what was learned in class and how the student feels about using technology.	Reflective teacher: Students relate how they plan on using technology in their future classrooms as professional technology-using teachers.
Dialogue with the instructor: Students ask the instructor questions or comment on any aspect of the class (including constructive critiques of how the material was presented).	Other experiences with technology: These responses generally describe students' experiences with technology in different environments, for example, their employment and other classes.

increasing technological world. It is probably not good for a teacher not to have any idea in instructing a student in how to operate different computer programs. I can only imagine how ugly a newsletter would be if I used only a word processor to create it.

Example 2

Fortunately I am not nearly as intimidated by the uses of technology now as I was in the beginning. When I imagined what the instructors of this class would be like I was scared I would get instructors who were unable to deal with people, only computers... I feel very comfortable with both of my instructors and am confident that if I don't understand something in class, I can get the help needed after class... To say the least my level of anxiety has been significantly reduced since the beginning of the semester.

Early feedback from the introduction of e-journals during the Fall, 1997 semester of EDLF 345 has been highly encouraging. E-journals are providing opportunities for reflection and a means to link what students are learning in the classroom with their future roles as technology-using teachers. They are also allowing students to converse with the instructors and share their meaning-making. Using e-journals as an instructional strategy also benefits the instructor. They help the instructor understand the student better as well as help him/her gauge and modify the class, which can have an impact on current and future students' needs. In addition, students themselves are more capable of understanding the technological world around them, and how they plan to deal with it.

Technology Portfolios

Whereas e-journals demonstrate learning in its developmental phases, portfolios represent the culmination of a student's work over a period of time, for instance, a semester. Many definitions exist in the literature regarding portfolios and the types of portfolios that exist. In general, a portfolio is a compilation and reflection of students' work, efforts, and progress. The different kinds of portfolios are showcase, descriptive, evaluative, and composite portfolios (Halaydna, 1997; Shackelford 1997). Each of these has unique objectives and methods for assessment. Shackelford (1997) suggests that "As instructional strategies, they promote the application of knowledge, self-assessment, and the development of individual talents, skills, and values" (p. 31). Furthermore, Russell and Butcher (1997) assert:

As a perspective over time during a course or curriculum, portfolios pull together a lot of information and artifacts. These materials lend themselves to formative evaluation and revision. Portfolios have the added advantages of allowing students to organize their knowledge, skills, and materials, to develop an in-depth understanding of the content, and to show peers and professionals what they have learned and can do.

A technology portfolio is similar to a traditional portfolio, but it specifically addresses technology skills and issues. Also, the medium is different since it is organized using a combination of electronic media such as hypermedia programs, database, spreadsheet, and word processing software, as well as CD-ROMs and the World Wide Web. Technology portfolios can be print-based, saved on a computer disk, compiled on a CD-ROM or HomePage, or a combination of the above. How it is published depends on the resources available in addition to the teacher's objectives. Tuttle (1997) contends that digital portfolios should be used because they demonstrate wider dimensions of learning, their parts can be interconnected, and they save space.

Levin (1996) explains that technology portfolios can be used to meet ISTE/NCATE guidelines. One challenge to meeting these guidelines is that cheaper, easier to use multiple choice tests do not accurately measure students' competence in technology. Technology portfolios are the answer to the dilemma as they serve as performance-based measures. Performance-based assessment has become increasingly accepted in education, especially by some major teacher education organizations, for instance, the Interstate New Teacher and Support Consortium (INTASC).

The items in a technology portfolio will depend on the context of the technology training, the resources available, and the amount of time (e.g., stand alone semester course or methods class that integrates technology). Levin (1991) and Petrakis (1996) describe the components for technology portfolios—specific to their objectives—which they have used with preservice teacher education students. The following items can be included:

1. Educational technology philosophy statement (Why technology is important for instructional purposes.)
2. Hands-on competencies/projects completed in the course
3. Weekly E-journal entries
4. Samples of work created outside of the requirements of the course
5. Self-evaluation of the items included in the portfolio

In EDLF 345, students collect examples of their work over the course of the semester for inclusion in their technology portfolios. These portfolios are intended to allow students to make a personal statement, which reflects their growth, change, and competence in the use of technology. As such, the keystone of the Technology Portfolio is a self-evaluation. Students are asked to provide an analysis of each piece of work that they choose to include in their technology portfolio. This self-evaluation must address three issues:

1. Students must comment on the quality of the work
2. Students must provide a rationale for each item's inclusion in the portfolio
3. Students must describe how - as a teacher - they might use the technology represented by the work toward an instructional goal

Students are encouraged to consider a broad definition of how success can be demonstrated. In this way, technology portfolios function as an instructional strategy that emphasizes problem-solving and the development of a conceptual understanding of software applications rather than simply the performance of various keystrokes, commands and menu selections. Instead, they are encouraged to consider patterns in the design of interface metaphors that serve or hinder user-friendliness and to critically evaluate much of the "hype" that surrounds technology promotion. Training preservice teachers to use technology requires that they be prepared to advocate for technology that supports their instructional goals and those of their students. It's likely that they will need to function as change agents in a system constantly under pressure to reform. For this reason technology use is not presented as merely a series of technical competencies, but also as having psychological, social, and economic aspects.

Self-efficacy and a reflexive approach

As defined by Bandura (1993), self-efficacy relates to an individual's perceptions about his or her own ability to perform a specific function. As such, it is a good predictor of behavior. People with low self-efficacy tend to shy away from those situations where they feel they have little control or ability to handle a task. Consequently, those with low self-efficacy toward technological innovation are likely to feel high levels of anxiety, and as a result, resist learning to use computers. Those same feelings of inadequacy about technology regulate the degree of commitment and perseverance an individual is willing to put forth to the learning situation (Olivier & Shapiro, 1993). Mager (1992) suggests that performance mastery is the principal way to help build self efficacy. Technology portfolios offer a means to document performance mastery as a personally relevant process, and e-journals help students reflect about the whole process.

The role of reflexive thought in preservice technology training is central to students' growth beyond a basic level of skill and operational facility in using technology and media for education. The use of technology portfolios and e-journals places an explicit focus on the relationship between technology applications and instructional methods. This reflexive approach to technology training encourages students to consider technology as both a user/learner and a user/teacher. In this way, students articulate their awareness of the effectiveness of instructional methods supported by technology and can develop skills to become thoughtful decision-makers regarding its uses. For example, by fostering opportunities for metacognitive development, a reflexive approach helps students gain accurate perceptions of how their behaviors may support or impede learning, as one student concluded in his portfolio:

Fall 1996 (Portfolio self-evaluation)

On September 3, 1996 I began a class on computer technology that I was sure would be a waste of my time. There was nothing I could learn that would enhance my teaching ability; I was positive. I guess it just goes to show that I shouldn't listen to my pride. We can all learn from the knowledge of others, so I have dedicated my portfolio a "Portfolio of learning" because this semester I learned that I am never too old to learn something that will benefit my students, and I should never let pride or fear of weakness stand in my way.

Specific competencies, such as those that require students to evaluate software, CD ROM's and websites can also nurture self-confidence and self-reflexive awareness. Focusing student attention on evaluation processes helps them to realize that as users rather than as programmers or technical specialists, they possess sufficient knowledge to judge technology's instructional utility.

Conclusion

Too often novice technology users discount their own level of experience with word processing software as a useful foundation for further skill development. E-journals and portfolios shift the emphasis from one of achievement to one of effort. They help to make students' technology training a sense-making process that is constructed at their own pace and is driven by their individual needs and interests. As one student wrote in her Technology Portfolio:

Fall 1996 (Portfolio self-evaluation)

I was very nervous about this class when I first registered for it. The only computer skill I possessed was word processing, and I had previously been frustrated with computers when I did not know how to operate them. I looked forward to learning about computers so that I could put aside some of my frustrations, yet I was worried that I would not be able to understand the material. Now I feel quite comfortable with computers. I may not be able to answer all the questions about computers or do some applications really fast, but I have enough knowledge about computers that I could probably figure out most problems.

A reflexive approach to technology training may employ performance-based approaches, such as the weekly skill-based competencies. However, a reflexive approach is constructivist in design as well because students actively participate in making their own meaning. Technology portfolios support students' learning by requiring them to make deliberate choices about what to include in their portfolios and to link their present skill level to a skill level at an earlier point in time. Technology training can be a thoughtful experience when it encourages students to comment on their learning through the use of e-journals and technology portfolios, to work collaboratively in both learner and instructor roles, and to critique technology's educational function. Finally, e-journals and technology portfolios

can be used as a means of meeting and demonstrating ISTE/NCATE guidelines as well as many states' licensure requirements for teachers.

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